


Module 2

Noise Audit Training

Purpose of this module

This module provides training on noise required to conduct a noise audit. It covers the following topics:

- ✓ Noise & hearing loss prevention
- ✓ Hearing protectors
- ✓ Fitting of hearing protectors
- ✓ Washington state noise regulations




Module 3 also provides required training and covers how to take basic noise measurements and hearing loss recordkeeping.

Module 2

Noise Audit Training

To do noise audits you must have training in the following:

1. Noise and hearing loss prevention
2. Hearing protectors
3. Fitting of hearing protectors
4. Washington state noise regulations
5. Conducting basic noise measurements
6. Hearing loss prevention recordkeeping




This module covers items 1–4. Module 3 covers items 5 & 6.

Noise Definitions

Sound Level

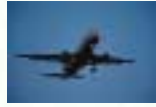
- Loudness
- Measurements made by a sound level meter
- Technically: the intensity of sound pressure waves hitting the ear drum



Noise Definitions

Noise

- Often described as “unwanted sound”
- Sound that is too loud, disturbs sleep, interferes with conversation, or causes hearing loss.
- Community or environmental noise is regulated by local ordinances.
- Workplace noise exposure is regulated by WISHA.



Noise Definitions

Noise Exposure

Sound level and duration – how loud and how long a person is exposed to noise.

*1 Hour?
8 Hours?*

What a person actually experiences – not just what noise a loud machine makes.



Noise Definitions

Decibel (dB)

The standard measurement of sound level

A logarithmic scale – 95 decibels is ten times the intensity of 85 decibels



85 dB



95 dB

Noise Definitions

Another View of Decibels & Loudness

One machine generates a noise level of **100 decibels**.



100 decibels



Put two identical machines together in the same room, and the noise level will be **103 decibels**.



103 decibels

Noise Definitions

Time Weighted Average (TWA)

TWA – average noise exposure a worker receives.

TWA₈ – Noise exposure over an 8-hour day.

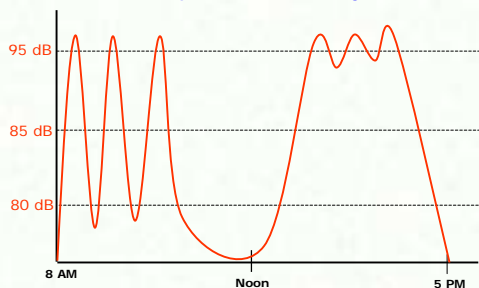
The WISHA noise standard is based on an 8-hour average noise exposure.

Highly variable noise levels are common in construction.



Average Noise Levels

How noise exposure can vary over time

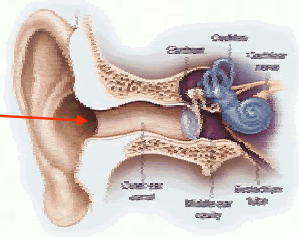


A typical construction worker's day of noise exposure

The Ear

Outer Ear

The visible ear and ear canal



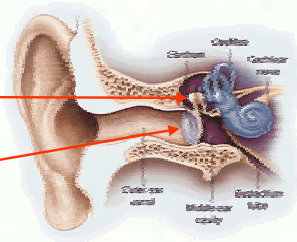
The shape of the ear canal can affect how well earplugs fit.

The Ear

Middle Ear

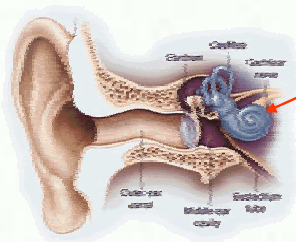
These 3 tiny bones transmit sound to the inner ear

eardrum



The Ear

Inner Ear



The cochlea and nerves

Damage from noise exposure occurs in the inner ear

The Ear

Inner Ear - Cochlea

The cochlea contains tiny hair cells which are moved by sound waves.

Loud noise knocks the hair cells over.

Eventually they never recover, resulting in hearing loss.



Inside of cochlea



Hair cells

The Ear

Hair Cells

Normal hair cells



This is your inner ear

Damaged hair cells



This is your inner ear on noise

Any questions?

Effects of Noise Exposure

Long Term Exposure to Noise

- Our ears can recover from short exposure to loud noise, but over time nerve damage will occur.
- The louder the noise and the longer the exposure, the greater chance permanent damage will occur.
- There is really no such thing as "tough ears" or "getting used to it".



Effects of Noise Exposure

Hearing Loss From Noise Exposure

- Hearing loss from noise exposure is often not noticed at first because it is so gradual.
- Usually a person loses the ability to hear higher pitches first.
- Often the first noticeable effect is difficulty in hearing speech.



Effects of Noise Exposure

Tinnitus From Noise Exposure

- Exposure to high noise levels can also cause permanent ringing in the ear or "tinnitus".
- Tinnitus sufferers usually complain of constant whistling, squealing, roaring or buzzing in one or both ears.
- Severe tinnitus can disrupt sleep, reduce concentration and cause irritability and depression.



Effects of Noise Exposure

What is Too Much Noise Exposure?

- Damage from noise exposure depends on the loudness and length of exposure.
- Scientific studies have shown that hearing loss will occur when 8-hour average noise exposure exceeds 85 decibels.



Effects of Noise Exposure

What is Too Much Noise Exposure?

- The risk of hearing loss increases dramatically as noise levels increase.
- Exposure to noise levels above **115 decibels** for even 5 minutes is very risky.
- Impact or banging noise above **140 decibels** will cause immediate damage to nerves in the ear.



Noise Levels

Examples of Commonly Used Noisy Equipment

<u>Equipment</u>	<u>Noise Level</u>
Back Hoe	85-95 decibels
Chain Saw	110 decibels
Front-end Loader	90-95 decibels
Gunshot	140 decibels
Jackhammer	112 decibels
Lawn Mower	90 decibels
Tractor	95-105 decibels
Circular Saw	90-100 decibels



Hearing Protection

Types of Hearing Protection



earmuffs

- There are three types of hearing protection – ear muffs, earplugs and ear caps.
- Ear muffs and earplugs provide about equal protection, ear caps somewhat less.



earplugs



ear caps

Hearing Protection

Types of Hearing Protectors

- All hearing protectors are designed to reduce the intensity (loudness) of noise to the inner ear.
- All three types have advantages and disadvantages and people vary on which they prefer to use.
- Wads of cotton or cloth are not acceptable as hearing protectors.



Cotton doesn't work!!

Hearing Protection

Hearing Protection – Ear Plugs

- Earplugs are made of foam, rubber or plastic and are either one-size-fits-all or in sizes small, medium and large.
- Some are disposable, some are reusable.
- They are lightweight, and require no maintenance.
- They are inserted into the ear canal.



Hearing Protection

Ear Plug Comfort

- Some people may find ear plugs uncomfortable to wear for long periods at first.
- Ear plugs rarely cause infection or prolonged irritation of the ear canal.
- Most people can find a comfortable fit by trying several different sizes, types or brands.
- Custom-molded earplugs can be obtained for maximum comfort.



Custom-molded earplugs

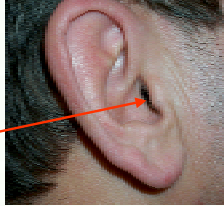
Hearing Protection

Getting a Good Fit With Earplugs

The shape of the outer ear and the ear canal can affect insertion of earplugs.

People have different size ear canals.

The shape of the "tragus" on the ear can sometimes interfere with earplug insertion.



Hearing Protection

Inserting Foam Earplugs

Foam type earplugs must be inserted properly into the ear for complete protection.



Roll earplug into small cylinder first, then insert in ear.

Hearing Protection

Inserting Foam Earplugs



Earplug incorrectly inserted



Earplug correctly inserted

Hearing Protection

Pre-formed (Rubber) Earplugs

Preformed earplugs come in several sizes.

Proper seating in the ear is essential.

Comfort is important – an uncomfortable plug will not be worn consistently.



Hearing Protection

Ear Muffs

- Ear muffs cover the whole ear and are preferred by some people.
- They have replaceable pads and some high-tech styles filter out specific noise pitches.
- They last longer than most plugs.



Hearing Protection

Attached Earmuffs

- Some muffs are attached to hardhats or goggles.
- Some high-tech muffs can filter out certain frequencies or have radios inside for communication in high noise areas.



Hearing Protection



Ear Muff Comfort & Glasses

- Muffs can be uncomfortable in hot weather.
- Muffs don't seal well for someone with glasses or heavy sideburns.
- Position of the head band will also affect how well the muff is sealed.



Hearing Protection

Ear Muff Band Position

Some earmuffs are made with bands that can fit behind the neck or under the chin.

The highest protection is on top of the head.

Check directions to ensure muffs are adjustable for other positions.



Hearing Protection

Ear Caps

- Ear caps are like earplugs, except they do not go into the ear canal, they only block it.
- They are good for occasional use or for people who find earplugs uncomfortable.
- They are not as protective as earplugs or muffs.



Hearing Protection

Definition: **Attenuation**

How effectively noise protectors reduce noise to the ear



The difference between noise out here,

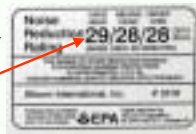


and the noise in here.

Hearing Protection

Noise Reduction of Hearing Protection

- The “noise reduction rating” or “NRR” of hearing protection is measured in decibels.
- The NRR is found on the earmuff or earplug package. The higher the number, the greater the protection (attenuation).
- The actual effective protection is seven decibels less than rating on package.



For additional NRR information, [click here](#).

Hearing Protection

Combined Use of Earplugs and Muffs

Dual hearing protection can be worn in extremely high noise areas (above 105 decibels).

Wearing earplugs under earmuffs will provide effective protection two decibels less than the higher NRR rating of the two protectors.



For more information, see [Table 2](#) in the Noise rule

Hearing Protection

Very Loud Noise & NRR

Hearing protectors must have an NRR rating of at least 20 decibels for noise exposure above 115 decibels.



Exposure to impact or banging noise above 140 decibels also requires using hearing protectors with an NRR of 20 decibels or greater.



Hearing Protection

How can you hear anything with earmuffs on?

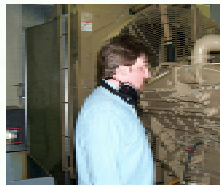
- Using earmuffs or plugs in noisy areas can actually make it easier to hear coworkers or machinery.
- They are similar to dark glasses that reduce the sun's glare making it easier to see.



Hearing Protection

Proper Use of Hearing Protection

- Earmuffs and plugs provide good protection only when used properly.
- Sometimes people will remove hearing protection for "just a minute" in a noisy area.
- In areas of very high noise exposure, this can quickly result in noise overexposure.



It won't protect his ears if it is around his neck!!!

Hearing Protection

Proper Use of Hearing Protection

- It takes just a few minutes of unprotected exposure at noise above 115 decibels to risk hearing damage.
- Earplugs not well inserted into the ear canal will not provide complete protection.
- Likewise, earmuffs not snug and covering the ear completely will "leak" noise into the ear.



Hearing Protection

Hearing Aids Are Not Hearing Protection

- Hearing aids do not block out enough sound for most workplace noise.
- Some hearing aids can actually increase the noise level at the ear.
- Just turning off the hearing aids will not prevent further hearing loss from noise exposure.



Noise Protection

Portable Radios/CD Players

"Walkmans" do not provide protection from noise.

The earphones are not earmuffs and the music only adds to other background noise.

"Walkmans" can exceed 85 decibels by themselves.



WISHA Noise Rule

2003 Noise Rule

WISHA adopted a revised rule on Hearing Loss Prevention/Noise in 2003.

This revised rule has no new requirements.

The rule includes noise audits as an option to audiometric testing.

To view rule, [click here](#)



Hearing Loss Prevention/Noise Rule

The Rule has six main requirements:

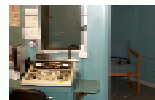
1. Conduct employee noise monitoring,
2. Install feasible noise reduction controls when employees are exposed to 8-hour average noise over 90 decibels,
3. Make sure employees wear hearing protection when exposed to 8-hour average noise levels of 85 decibels or greater,



Hearing Loss Prevention/Noise Rule

The Rule has six main requirements(con't):

4. Train employees on effects of noise and use of hearing protection,
5. Periodically check employee's hearing with audiometric testing (or use the noise audit option),
6. Post warning signs at high noise areas.






WISHA Noise Rule

Noise Monitoring

The Noise Rule applies to any employer who has employees exposed to average noise levels of 85 decibels or above.

If your employees need to shout to be heard three feet from each other, the noise level is probably above 85 decibels.

Noise levels must be measured with noise instruments.



WISHA Noise Rule

Reduce Noise Levels Where Feasible

If employees are exposed to average noise levels above 90 decibels, you must reduce noise levels with controls such as enclosures, barriers, or mufflers.

Controls are possible for many noise sources.

The WISHA Noise Reduction Ideas Bank has examples of controls.

[Click here](#) to go to Noise Reduction Ideas Bank

WISHA Noise Rule



Provide Hearing Protection for Employees

When controls are not possible, provide hearing protection for employees.

Employees can select a hearing protector from at least two choices.

Hearing protectors must be appropriate for conditions.

Make sure employees wear hearing protectors whenever they are exposed to excessive noise.

WISHA Noise Rule

WISHA Hearing Protection Requirements

The table below shows noise levels and when hearing protection must be worn.

Noise Level	Employee Exposure Time
85 decibels	8 hours or more
90 decibels	4 hours or more
100 decibels	1 hour or more
105 decibels	30 minutes or more
110 decibels	15 minutes or more
115 decibels	Hearing protection always required



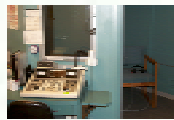
WISHA Noise Rule

Audiometric Testing (Hearing tests)

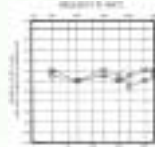
Provide hearing tests to employees who are exposed to average noise levels above 85 decibels.

Provide the hearing tests within six months of first employment or first exposure to noise.

Provide hearing test records to affected employees.



Audiometric testing booth



Audiogram

Noise audits are an option to audiometric testing for short-term employees.

WISHA Noise Rule

Worker Training

Train exposed workers when they are first assigned to a noisy job or position.

Train on the following topics:

- ✓ Effects of noise
- ✓ Noise controls used in your workplace
- ✓ purpose of hearing protection
- ✓ instructions on hearing protection use
- ✓ Purpose & procedures of audiometric testing



To view a training module on these topics, [click here](#)

WISHA Noise Rule

Noise Warning Signs

Post warning signs at the entrance or edge of areas or rooms where noise levels exceed 115 decibels.



Check Your Understanding

Question 1

Hearing loss will occur when:

- a) The noise levels hurt the ears
- b) The noise level is above 85 decibels
- c) The noise level is above 85 decibels over 8 hours.

Check Your Understanding

Question 2

Exposure to noise for a short time can cause hearing loss when:

- a) When the noise level is above 115 decibels.
- b) When the noise is right next to the ear.
- c) Short exposures will not cause hearing loss.
- d) A person is very sensitive to noise.

Check Your Understanding

Question 3

What is the best hearing protection?

- a) Ear plugs
- b) Ear muffs
- c) Either earplugs or earmuffs
- d) The one that the employee prefers

Check Your Understanding

Question 4

What is NRR?

- a) The noise level of rifles.
- b) The noise rating of loud machines.
- c) The noise reduction rating of hearing protection.
- d) A measure of how well earplugs work.

Check Your Understanding

Question 5

The WISHA noise rule requires the following:

- a) Provide hearing protection for all employees
- b) Find ways to reduce noise levels first.
- c) Wear earplugs when the noise level is above 85 decibels.
- d) Provide hearing protection in noisy areas

End of Module 2

Go to Module 3
